

Attorney Docket No.: F071

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.: 10/055,320

ART UNIT: 2825

APPLICANT(S): Neil J. Bassom

EXAMINER: Renzo Rocchegiani

FILING DATE: January 23, 2002

TITLE: Fabrication of High Resistivity Structures Using Focused Ion Beams

DECLARATION UNDER 37C.F.R. 1.32

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

1. I, Neil J. Bassom, am a named inventor on US. Pat. No 10/055,320.
2. I am employed by FEI Company, the assignee of the above-identified invention.
3. I hold a Doctoral degree from Oxford University, UK, and have worked in the field of focused ion beam processing for approximately 8 years.
4. The invention described in U.S. Pat. App. No. 10/055,320 relates to a system for depositing high resistivity, conductive materials using a focused ion beam.
5. Focused ion beams (FIBs) have been used to decompose precursor gases to deposit insulators and conductors. The resistivity of an FIB-deposited material depends on its composition. For example, FIB-deposited tungsten has a lower resistivity than FIB-deposited platinum, and impurities in a FIB-deposited material also affect its resistivity.
6. Typical conductors deposited by FIB have resistivity of between about $5 \mu\Omega\text{cm}$ and about $1000 \mu\Omega\text{cm}$. Typical insulators deposited by FIB have resistivity of between about $1 \times 10^{12} \mu\Omega\text{cm}$ and about $1 \times 10^{15} \mu\Omega\text{cm}$.

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7. My invention comprises a system for depositing high resistivity, conductive materials. Skilled persons working in the field of charged particle beam processing around January 26, 2001, the priority date of the present application, would consider a high resistivity, conductive material to be a conductive material that has a resistivity higher than that of prior art FIB deposited conductors and lower than that of prior art FIB deposited insulators.

8. As one skilled in the art, I would consider, for example, materials having a resistivity of between about $5 \times 10^4 \mu\Omega\text{cm}$ and about $5 \times 10^7 \mu\Omega\text{cm}$ to be high resistivity, conductive materials.

9. Because the precursor gases of deposited metals typically include organic components, some oxygen or carbon is typically incidentally included in the deposited metal.

10. U.S. Pat. No. 6,261,850 to Marsh ("Marsh") teaches a method for providing a conductive material having reduced carbon and/or oxygen. Marsh does not specify the resistivity of the material deposited using his method, but he does specify that his method reduces impurities and that reducing impurities would reduce the resistivity.

11. Marsh describes the FIB deposition of platinum from an organometallic precursor. Prior art deposition of platinum typically had a resistivity of between about $70 \mu\Omega\text{cm}$ and about $400 \mu\Omega\text{cm}$. Marsh teaches a process that is supposed to reduce impurities and decrease resistivity, so I would understand that the resistivity of the platinum deposited by Marsh is less than about $400 \mu\Omega\text{cm}$, which is outside the range of the high resistivity material described above.

12. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are

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punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



Neil J. Bassom

Date

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